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State-of-the-Art Measurement Analysis Software, Training and Consulting Services

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UncertaintyAnalyzer FAQs

Integrated Sciences Group answers frequently asked questions about our UncertaintyAnalyzer software. The answers are intended to provide further clarification about the capabilities of our flagship software for calculating and analyzing measurement uncertainty. If you have any questions or comments regarding any of the FAQ topics listed below or would like us to answer additional questions, please contact us at isg@isgmax.com.

Question	Answer
How does UncertaintyAnalyzer compare to Uncertainty Sidekick Pro?	In addition to direct and multivariate measurements, UncertaintyAnalyzer contains specially designed screens to analyze uncertainties for linear measurement systems. UncertaintyAnalyzer has a reliability modeling feature that can be used to project uncertainty growth and contains an Analysis Guide Screen that provides a comprehensive, tree-view presentation of measurement uncertainty analysis concepts and methods, program features, operating procedures, analysis examples and other topics.
	Additional features and functions available in UncertaintyAnalyzer are too numerous to effectively describe in a few paragraphs. A quick reference table comparing UncertaintyAnalyzer's features and capabilities to our Uncertainty Sidekick freeware and Uncertainty Sidekick Pro software is accessible from our website.
What is the difference between a multivariate measurement and a measurement system?	When the value of a quantity is obtained by the measurement of other constituent quantities, it is called a multivariate measurement.
	A measurement system is comprised of component modules (e.g., sensors, multiplexers, signal conditioners, etc) arranged in series. Input uncertainties not only propagate from module to module, additional contributions from each module are picked up along the signal path.
Why would I need such a powerful software application as UncertaintyAnalyzer?	UncertaintyAnalyzer is the most versatile, state-of-the-art tool for analyzing any type of measurement process, from very simple to highly complex. It is designed to be an all-in-one uncertainty analysis tool for scientists, engineers, metrologists, or anyone else in the general technical community involved in making or interpreting measurements.
Is UncertaintyAnalyzer difficult to use?	No. UncertaintyAnalyzer utilizes interactive, step-by-step procedure checklists that access drill-down screens and

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	worksheets that are designed to facilitate the analysis of direct measurements, multivariate measurements or measurement systems.
	In fact, UncertaintyAnalyzer incorporates the expertise of engineering, physics, statistics, decision theory and measurement science disciplines in an array of templates and screens that greatly expedite even the most complex measurement uncertainty analyses. UncertaintyAnalyzer also has a full on-screen Help function and comes with a comprehensive user manual.
Are uncertainty estimates made with UncertaintyAnalyzer suitable for calibration laboratory accreditation?	Yes. UncertaintyAnalyzer is the most comprehensive measurement uncertainty analysis tool available for achieving compliance with ISO 17025 and ANSI/NCSL Z540.3. UncertaintyAnalyzer incorporates and extends the methods found in the *ISO Guide to the Expression of Uncertainty in Measurement* (GUM).
Has UncertaintyAnalyzer been approved by laboratory accreditation organizations?	No. Contrary to what other companies may claim, accreditation organizations do not (and should not) endorse any software application for estimating measurement uncertainty.
	Occasionally, a customer will encounter an assessor that prefers to see a simplified or "dumbed-down" uncertainty analysis. However, there has never been any problem with our software providing the uncertainty analysis and reporting requirements needed to achieve accreditation.
What error distributions are accounted for in UncertaintyAnalyzer?	UncertaintyAnalyzer contains an extensive list of probability distributions to choose from, including: Normal, Lognormal, Exponential, Quadratic, Cosine, U-Shaped, Uniform (rectangular), Triangular, and Student's t. Many of UncertaintyAnalyzer's screens display a plot of the selected distribution to assist in you in the development of uncertainty estimates.
How do I choose the appropriate probability distribution for each error source?	In most cases, UncertaintyAnalyzer will automatically selects the appropriate probability distribution based on user input. UncertaintyAnalyzer will usually apply the normal distribution by default, unless the user selects an alternative distribution. When using the Resolution Error Worksheet, UncertaintyAnalyzer defaults to the uniform

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	distribution when the digital display option is selected.
	Regarding the combined error distribution, if the degrees of freedom for the combined uncertainty are finite, then the Student's t distribution is used to develop confidence limits for a user-specified confidence level. If the degrees of freedom are infinite, then the normal distribution is used.
	Note: UncertaintyAnalyzer's on-screen Help function and Analysis Guide screen each present measurement uncertainty analysis concepts and methods that include recommendations for selecting appropriate error distributions.
Why can't I simply use an Excel spreadsheet to develop my uncertainty analyses?	A main advantage of spreadsheet programs, such as Excel, is that most technical personnel routinely use them. However, considerable programming effort is required to fully implement the uncertainty analysis methods outlined in the ISO GUM. This includes the development of algorithms for computing partial derivatives of multivariate measurement equations.
	The resulting robust uncertainty analysis tool quickly becomes a full-fledged software application instead of a simple spreadsheet template. An ISG paper that details why spreadsheets are inadequate for uncertainty analysis can be downloaded from our website.
Why isn't UncertaintyAnalyzer designed to run as a plug-in for spreadsheet applications like Excel or Lotus?	UncertaintyAnalyzer's features, functions and capabilities are too advanced for a spreadsheet plug-in. There are additional issues with configuration control, error trapping and macro viruses that are outlined below.

1. More and more companies and government agencies are realizing how difficult it can be to ensure the integrity of worksheet calculations and built-in macros after they have been widely distributed. The primary reason for this is that spreadsheet programs like Excel or Lotus are specifically designed to provide easy access to the full functionality of the program. Consequently, it is not difficult for someone with a moderate familiarity with spreadsheet programs to access and modify many of these "behind-the-scenes" macros by simply copying the spreadsheet template(s).

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	2. Employing password protections and hiding cells cannot completely prevent access to and modification of macros and equations without significantly degrading the overall functionality of the user interface.
	3. An uncertainty analysis tool should always include error traps to ensure that realistic information and data are entered in the appropriate fields and cells. Error trapping is more difficult with Excel or Lotus spreadsheet programs because the cells in which data are entered cannot be completely secured.
	4. As with other Microsoft applications, Excel workbooks and worksheets are particularly vulnerable to macro viruses. Simply opening an infected workbook can activate the virus. Utilizing Excel's security feature to block potentially unsafe macros often causes problems running plug-in applications. As a result, the security level must be set at low and you'll have to rely on your antivirus software to effectively scan and protect you from potential macro viruses.
	5. It is unwise to assume that MS Excel provides validated math functions. Over the years we have identified several instances where the MS Excel statistical functions provide insufficient precision for uncertainty analysis calculations. Some of the functions are not defined properly, producing incorrect results. Kurtosis, a measure of the peakedness of the distribution of a sample of data, is an obvious example.
Why isn't the ability to modify spreadsheet macros a desirable feature?	If a company claims that it allows user's to modify their macros or other software code, it is an acknowledgement that the application is not robust or comprehensive enough to handle a wide variety of analysis scenarios. As a result, the software quickly becomes an uncontrolled shareware application. This an imprudent approach for developing freeware applications, let alone software products.
What reports can I generate with UncertaintyAnalyzer?	UncertaintyAnalyzer has a variety of reporting levels, including summary reports and "drill-down" reports for complete communication of your analysis results.

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Has UncertaintyAnalyzer been validated?	Currently, there are no standards or guidelines for testing and validating uncertainty analysis software. However, there are many common-sense protocols that ISG applies, some of which are summarized below.

Validation of mathematical and statistical methods.
ISG routinely publishes papers and articles that clearly describe the mathematical and statistical concepts that are incorporated in our software products. This serves two purposes:

1. It shows that we have an unsurpassed technical understanding of uncertainty analysis concepts and principles.
2. The information can be reviewed and scrutinized in the public domain.

Verification of numerical approximations and calculations.
Depending upon the sophistication of the numerical algorithms, our program calculations are verified via hand calculations, Excel spreadsheets, or math and statistics applications such as MathCAD. Verification of numerical algorithms are achieved in a number of ways including:

1. Extensive alpha testing via internal peer review and verification.
2. Vigorous beta testing via external review and verification by selected customer base.
3. Widespread peer review and verification via distribution of freeware subprograms and applets.
4. Large-scale customer use and feedback over the past 15+ years.

Verification of program functionality.
Another important aspect of our software validation is the verification that the program screens, templates, or worksheets function as intended and that data entered into drill-down screens are properly stored and transferred to other screens as needed. Our protocol for testing and validating program functionality is the same as described for numerical algorithms.

Note: When software validation is of primary concern, we

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	provide customers with specific validation reports upon request. These reports are designed to help our clients verify that our software performs in accordance with its intended use.
Will UncertaintyAnalyzer run on the Windows 7, Vista, Macintosh or Linux operating systems?	UncertaintyAnalyzer is a 32-bit Windows-based application. Therefore, it will run on the 32-bit editions of the Windows 7 and Vista operating systems. The Microsoft WOW64 emulator also allows 32-bit applications to run seamlessly on the 64-bit editions of these operating systems.
	UncertaintyAnalyzer does not run on the Macintosh or Linux operating systems. However, several of our customers use our software on Macintosh computers running a PC emulator program without any degradation in functionality. Similar PC emulator programs are available for the Linux operating system.
How does UncertaintyAnalyzer compare to software offered by other companies?	UncertaintyAnalyzer is the most comprehensive measurement uncertainty analysis tool available. Our customers consider it to be the Swiss Army Knife of uncertainty analysis software products. In fact, UncertaintyAnalyzer is the only software application that can be used to design and evaluate complex measurement systems.
	As a developer and marketer of uncertainty analysis tools, it is important for Integrated Sciences Group to periodically assess the capabilities of similar software applications. An up-to-date review and comparison of several commercial and freeware applications is accessible from our website.
What kind of technical support can I expect to receive?	Technical support is a major consideration for many software users, especially when using a specialized analysis program. Registered users of UncertaintyAnalyzer have access to free technical support (via phone, fax and email) from professionals with established measurement uncertainty analysis expertise.
Why should I purchase uncertainty analysis software from ISG?	Since ISG has been a major pioneer in developing measurement science analytical methodology over the past 30 years, our software products embody the most advanced tools and methods available.

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	Our state-of-the-art software products not only comply with ISO standards and guidelines, they also incorporate several ground-breaking measurement uncertainty analysis methods and techniques developed and published by ISG personnel.
	Our commitment to product excellence is epitomized by an unmatched level of software maintenance and support. Unlike other companies, we continually strive to improve the functionality of our software by including customer suggested new features or enhancements as part of our free service updates.